

Cadastral Information Management with ArcGIS

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ArcGIS 9.2

- Survey Analyst Product

- ✓ Survey Editor

- ✓ **Cadastral Editor**



- Survey Analyst, product *upgrade*
 - Survey Editor
 - *Cadastral Editor*
 - *Enter data from survey documents*
 - *Join parcels together*
 - *Add survey control*
 - *Apply LSA to the completed cadastral network*
- 9.2 SP3

Cadastral Editor vs Survey Editor

- *Survey Editor* designed to edit and manage the data stored in a Survey Dataset
 - A collection of computations, measurements, and survey points that are shared within a predefined geographic area.
 - Stores and manages field observations from field equipment and used by surveyors
- *Cadastral Editor* designed to edit and manage data held in a *Cadastral Fabric*
 - composite layer defined by a group of feature classes of parcels, lines and points
 - A workflow for editing and managing cadastral data

Goals of the Cadastral Editor

- *Improve the accuracy* of data in GIS using control points and documented measurements
 - *Incrementally improve positional accuracy of cadastral fabric and standard feature classes*
- *Improve the efficiency* of cadastral data management workflows
- *Improve the spatial locations* of data layers associated with the cadastral fabric
- Integrate parcel data from electronic CAD and XML files

Why Use Cadastral Editor?

- Sound survey methodology
 - Least Squares Adjustment (no rubber sheeting)
- Continuously enhance your data
- History is maintained (chain of title)
 - Legal dates and system dates
- Foundation for GIS data
- Query capabilities
- Seamlessly use multiple projections

Who Uses the Cadastral Editor?

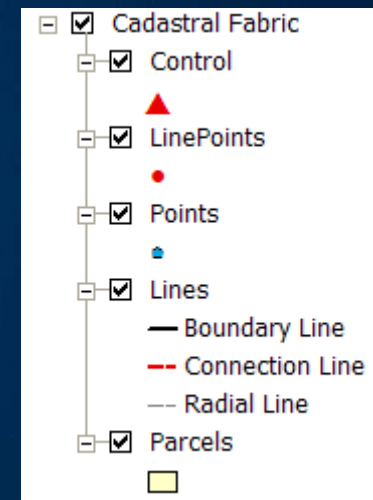
- Organizations that
 - Spend a lot of time adjusting new data so it fits in with existing data
 - Maintain a layer of control points
 - Use CAD-based software for COGO functions
 - Employ or contract work out to surveyors
 - Submit survey record information to a local government authority
 - Receive submissions of survey record information
 - Perform cadastral boundary relocation surveys and/or new subdivision surveys
- Organizations where
 - Other departments within the organization use cadastral record information as a basemap for their own GIS layers
 - At least 50% of the original record measurements are maintained in digital form

Benefits

- Honor the intent of the originating survey and legal record
- Be able to maintain spatial accuracy through time
- Track parcel lineage
- Utilize control point coordinates to improve spatial accuracy and value

What is a Cadastral Fabric?

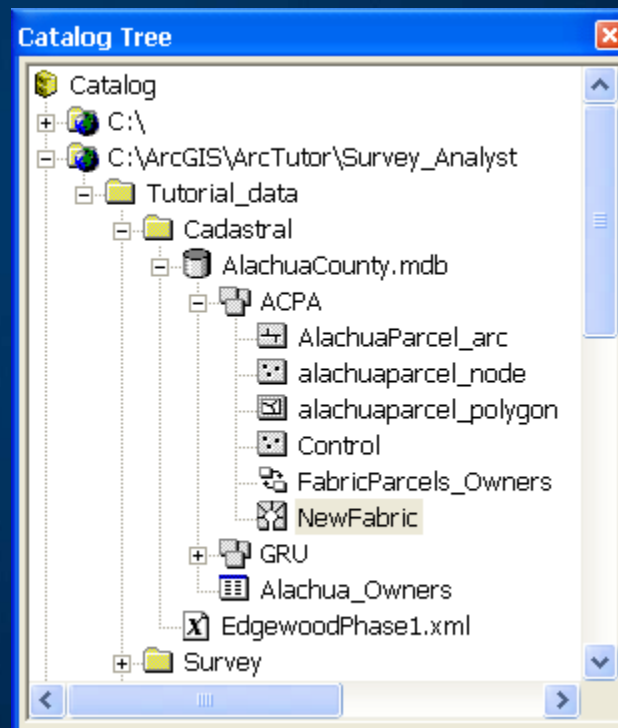
- A *continuous surface* of connected parcels
- A *composite layer* defined by a group of related feature classes of parcels, lines and points
 - Self standing entity
- A dimensioned *boundary network*
- Adjusted by *Least Squares*
- Can only be edited with cadastral fabric editing tools



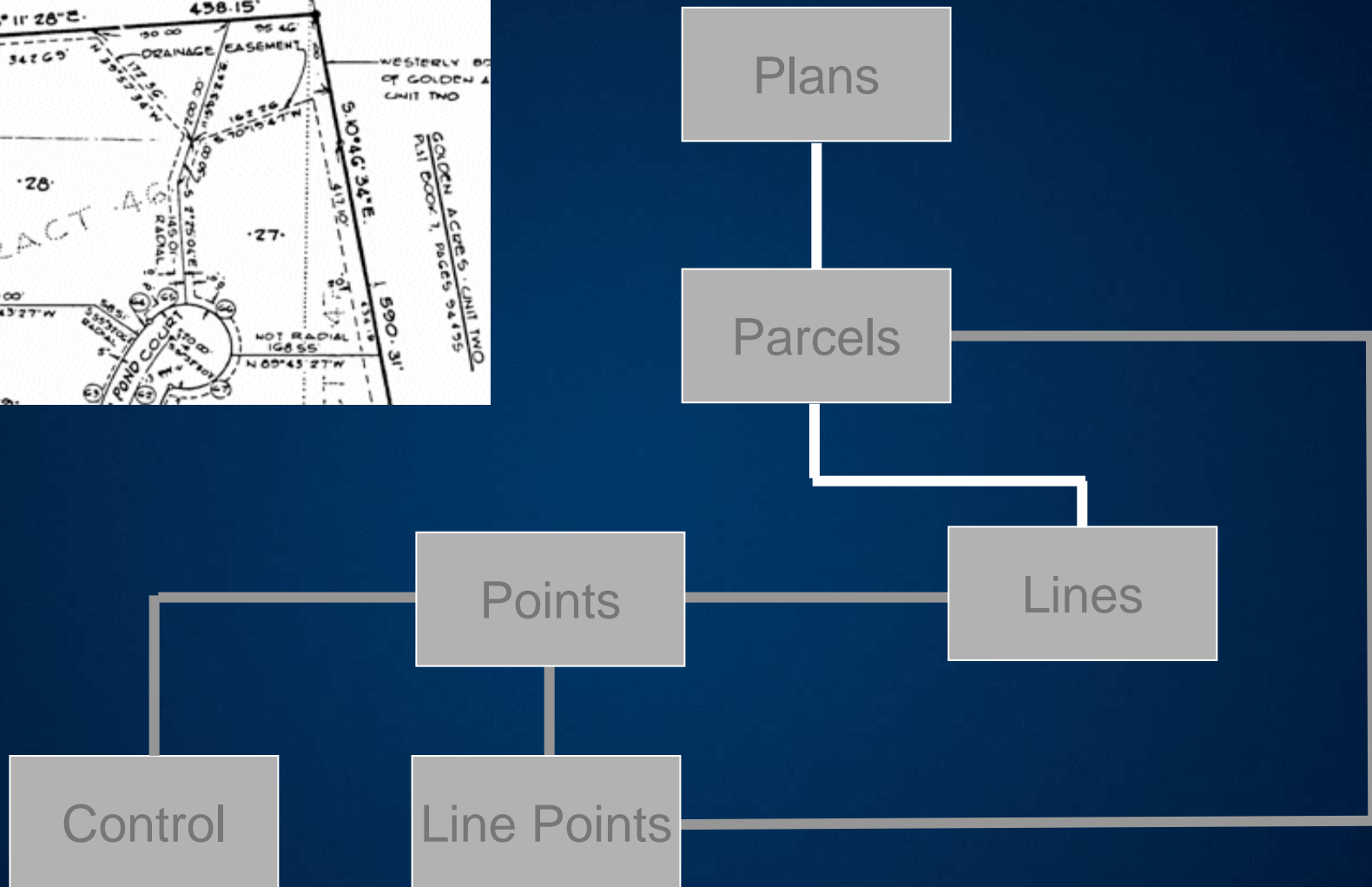
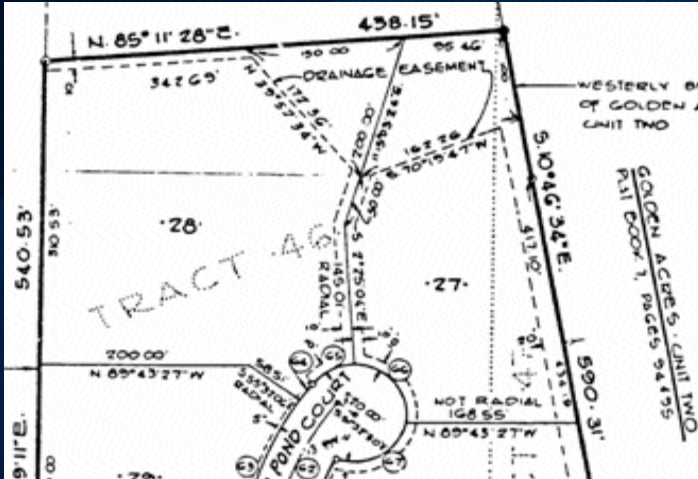
NOTE: An existing cadastral fabric layer is recognized by ArcMap even if the Survey Analyst Cadastral Editor extension is not installed. The Survey Analyst Cadastral Editor extension is required to edit and update the cadastral fabric

Managing the cadastral fabric

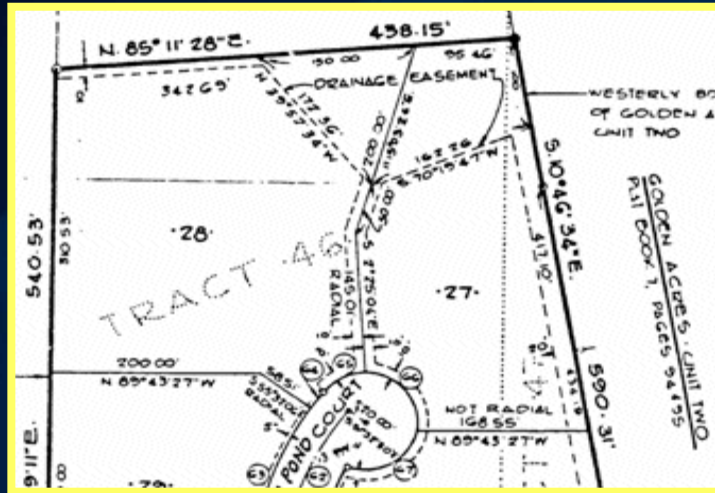
- Through single node in ArcCatalog
 - Feature dataset extension
 - Fabric inherits coordinate system from parent feature dataset



How cadastral fabric data is stored



How cadastral fabric data is stored



Plans

ID	Name	SurveyDate
1	Crane's Roost	25-Aug-07

Parcels

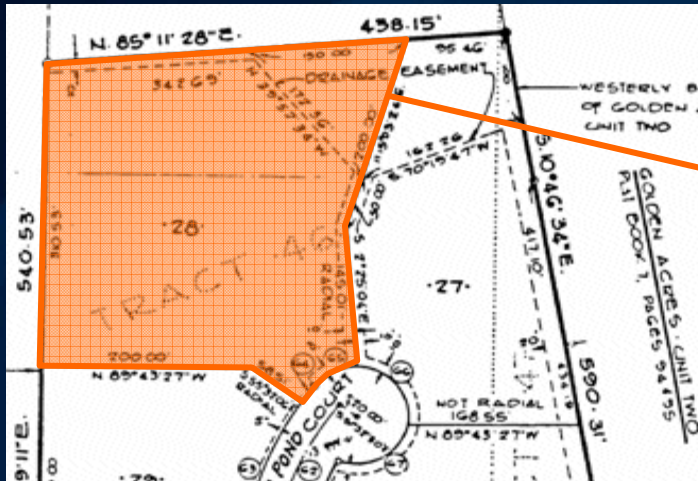
Points

Lines

Control

Line Points

How cadastral fabric data is stored



Plans

ID	Name	SurveyDate
1	Crane's Roost	25-Aug-07

Parcels

ID	Parcel Name	Plan ID
100	28	1

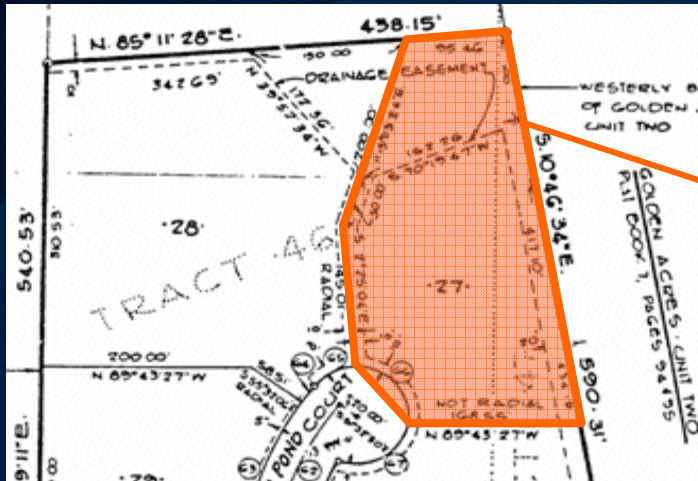
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Plans

Parcels

Points

Lines

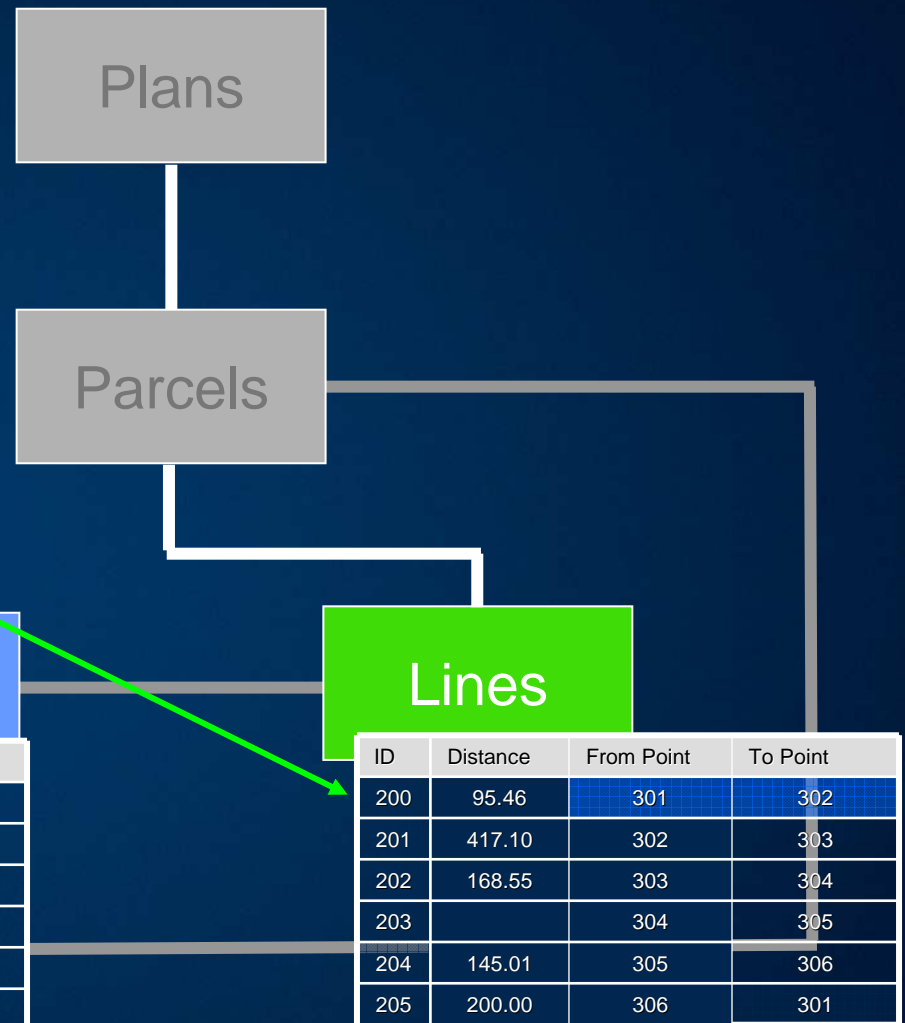
Control

Line Points

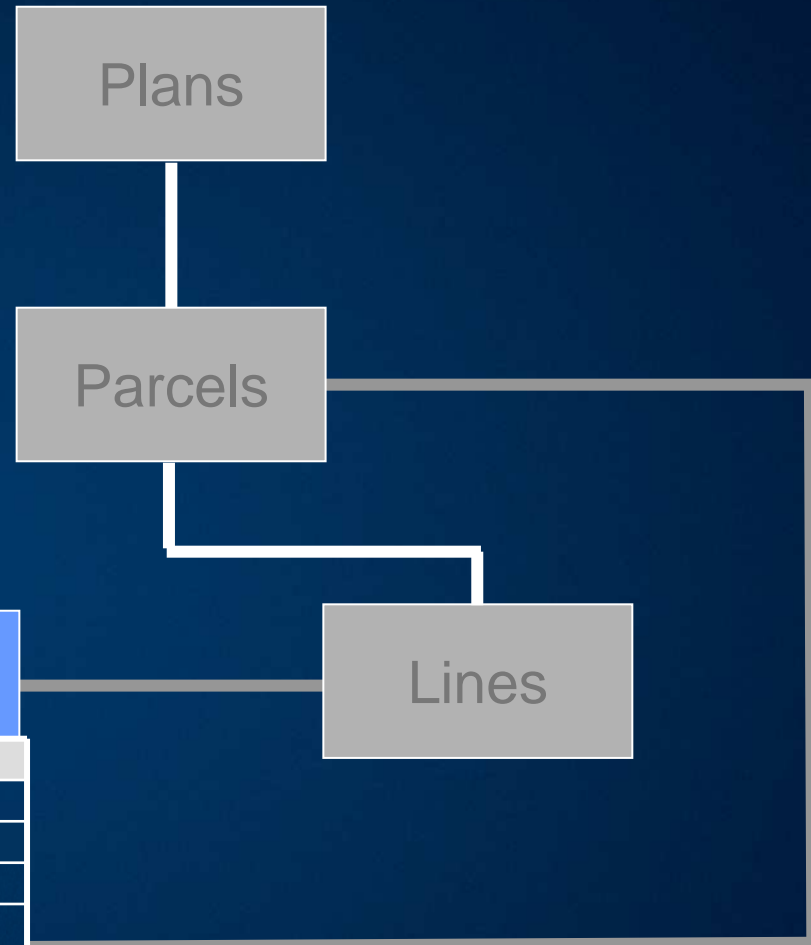
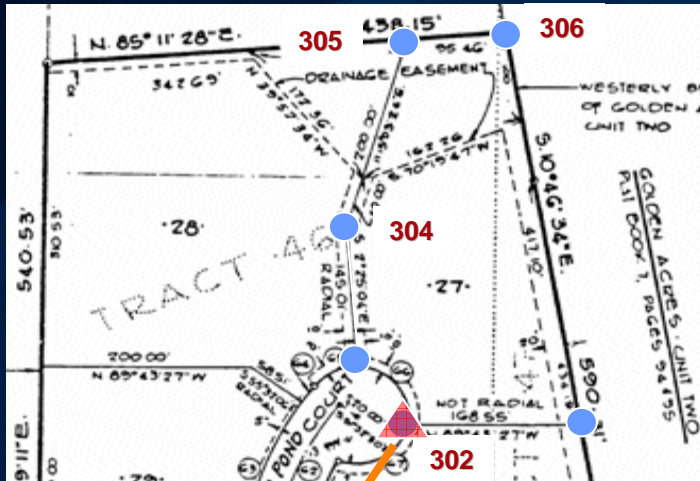
ID	Parcel Name	Plan ID
100	28	1
101	27	1

ID	Bearing	Distance	Parcel ID
200	N85-11-28E	95.46	101
201	S10-46-34E	417.10	101
202	N89-43-27W	168.55	101
203			101
204	S 2-25-04E	145.01	101
205	N 3-03-26E	200.00	101

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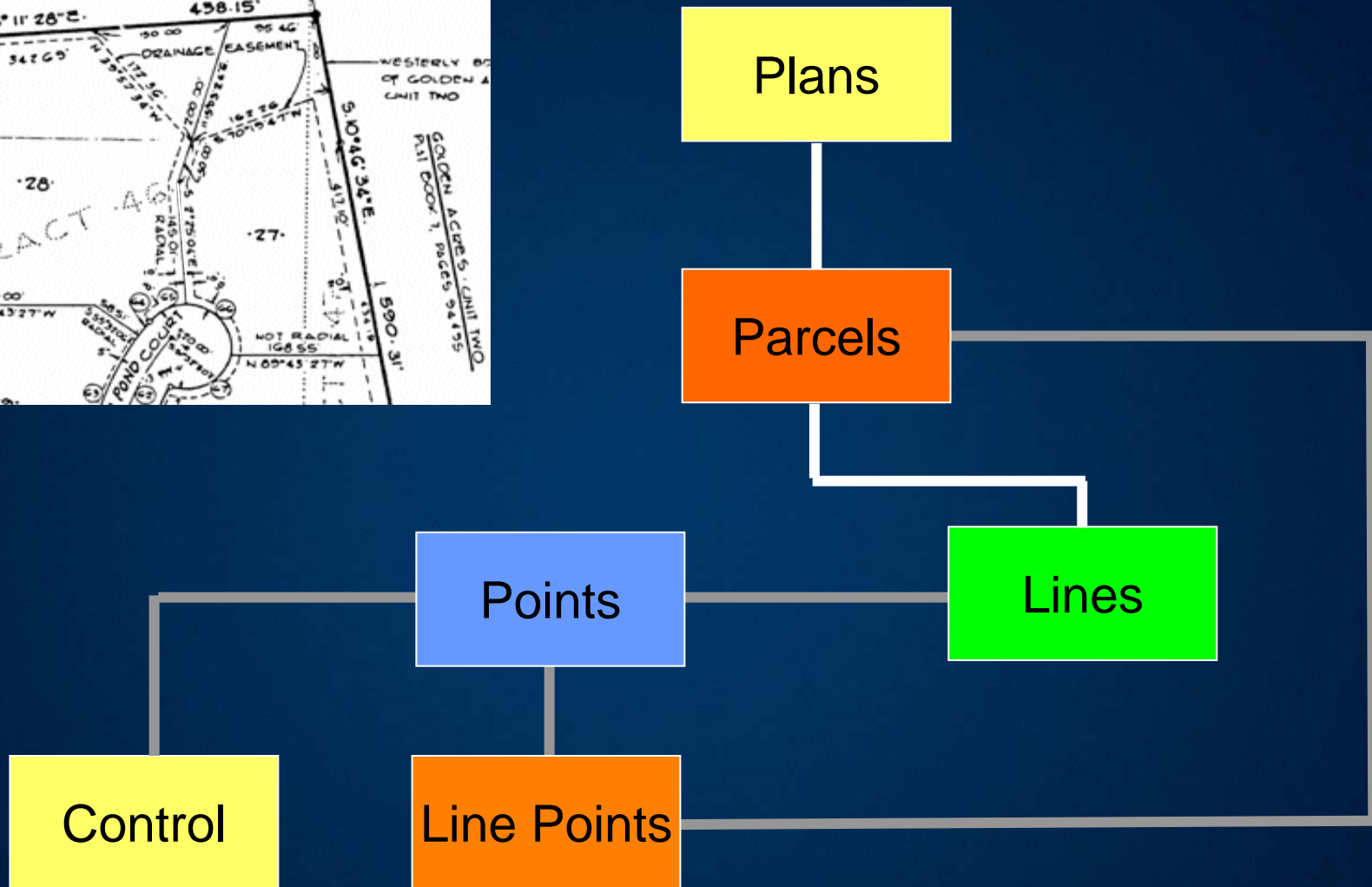
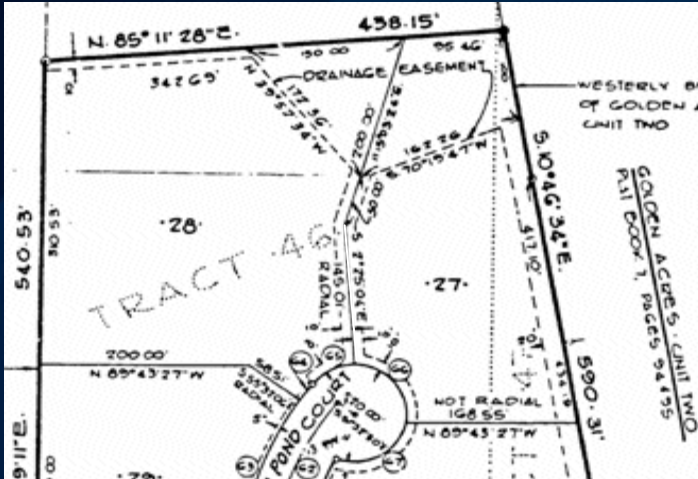


ID	Name	X	Y	Z	PointID
401	CP1				302

Control

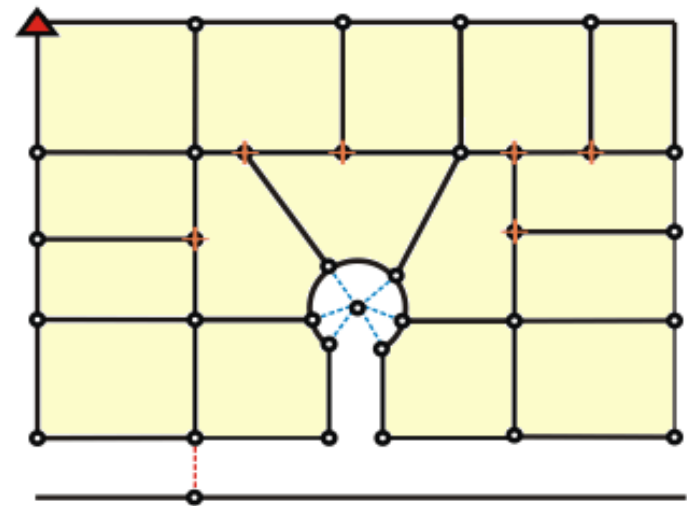
Points			
ID	X	Y	Z
301			
302			
303			
304			
305			
306			

How cadastral fabric data is stored



Fabric as a Network

- Parcels are the '*unit of work*'
 - Create and edit *parcels*
 - Join *parcels* to the fabric
- Control points *fix* and *geo-reference* the fabric
- Fabric network and control points are adjusted by *least-squares*



Fabric as Control for GIS

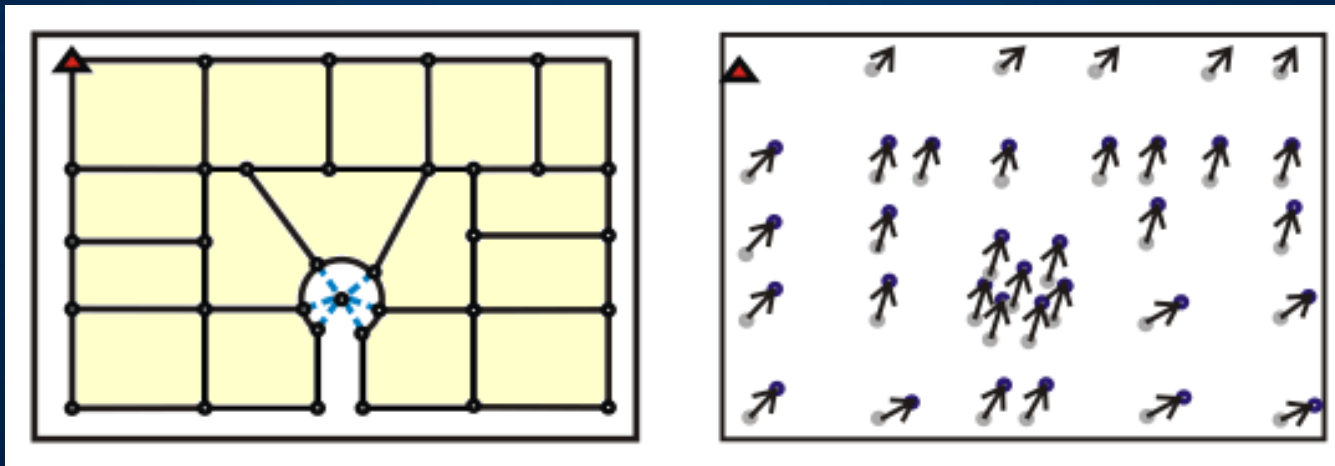
- GIS feature layers often maintained in context with the cadastre
- A positionally accurate cadastre then *controls* the GIS
- Capture coordinate shifts after adjustment
 - therefore adjusting associated layers and maintain spatial relationships
- The result is more accurate coordinates *all around*

Least-squares adjustment (LSA)

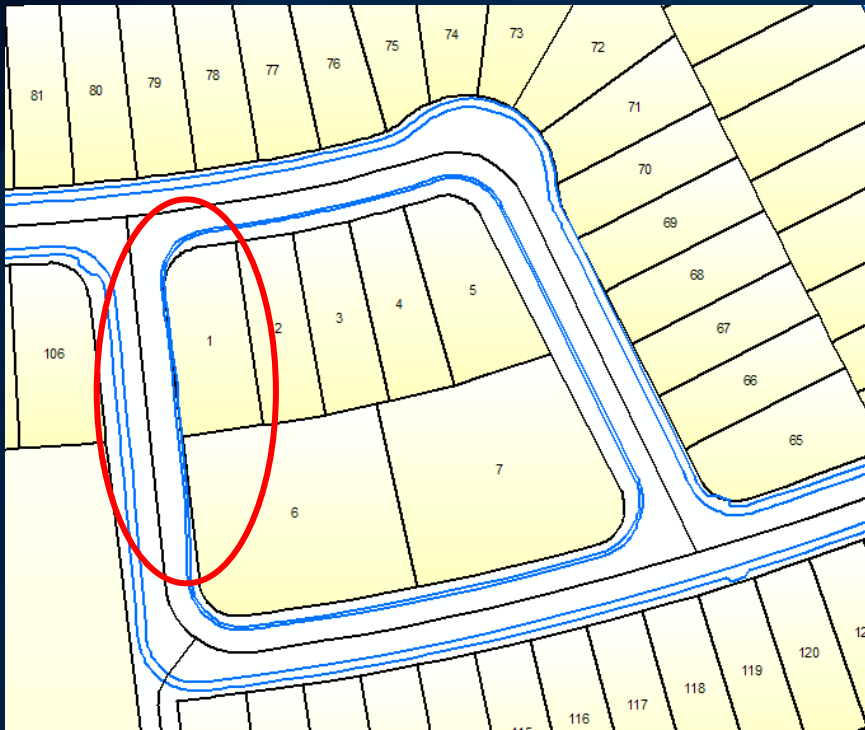
- ***Fabric + Control + LSA = Good Coordinates***
- More than improves coordinates
 1. Shows where additional control is needed
 2. Helps isolate errors in the data (e.g. incorrectly entered measurements)
 3. Removing mistakes increases accuracy
- Outputs post-adjustment analysis reports
- ***Never changes the original measurement values***

GIS Feature Adjustment

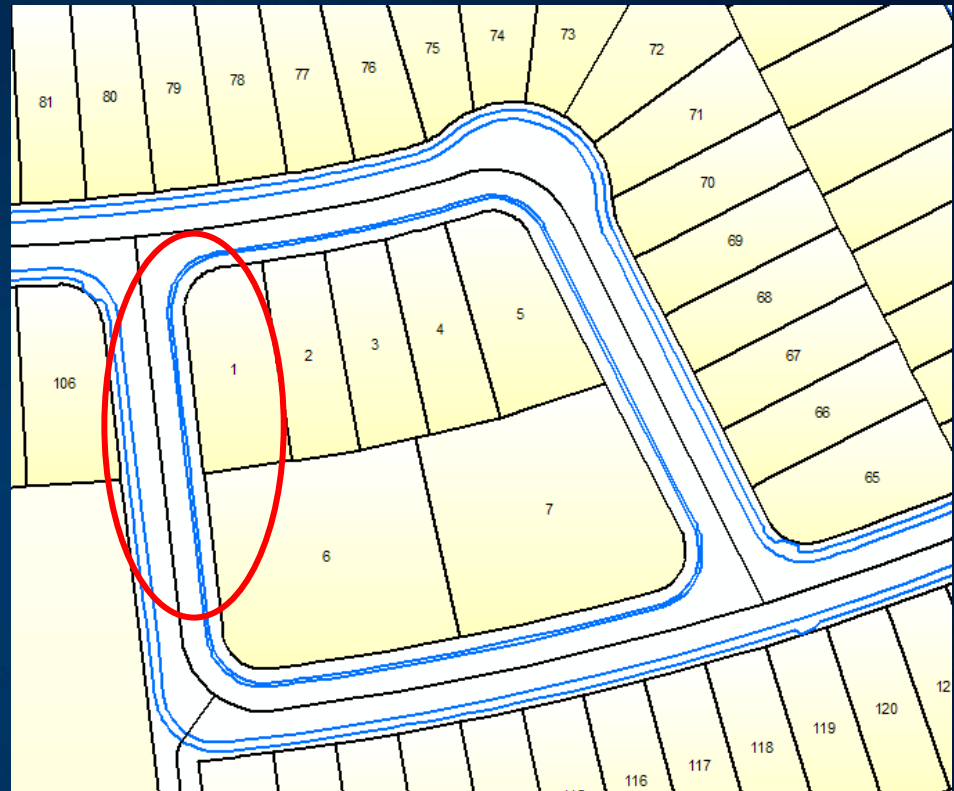
- Using LSA results we create a set of *adjustment vectors*
 - An adjustment vector is the *displacement* between a point's original coordinate and new coordinate after LSA
 - History of coordinate changes based on each sequential LSA
 - Created by software after least squares is applied in a job



GIS Feature Adjustment



***Utility line features
incorrectly located with
respect to the fabric...***



***Using adjustment vectors,
utility line features are
adjusted to the fabric.***

What is the Result?

- A cadastral fabric that is:
 - *Accurate* to the same mathematical integrity of the original survey measurements
 - *Complete* by preserving all survey data
- A *GIS database* of original survey measurements
- Correctly *geo-referenced* GIS feature layers to the fabric

Demonstration

Training

ArcGIS Survey Analyst: Maintaining Land Records Using the Cadastral Editor (ILV)

- This course is designed for experienced ArcGIS users who want to create, update, and manage accurate and seamless cadastral networks from survey plans and electronic subdivision data.
- It is also useful for GIS users who need to work with cadastral datasets and survey information.
- Land record and survey professionals will find the course of particular benefit.

Thanks!

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